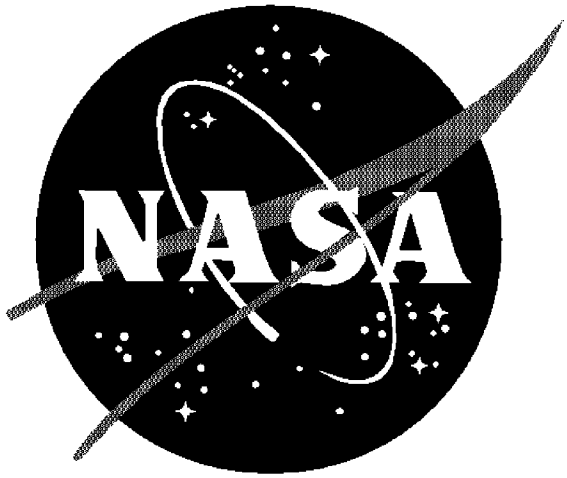

National Aeronautics and Space Administration

November 20, 2001

NRA-01-OES-05

RESEARCH ANNOUNCEMENT

SOLID EARTH AND NATURAL HAZARDS RESEARCH AND APPLICATIONS

Notices of Intent to Propose Due – December 21, 2001
Proposals Due – February 4, 2002

OMB Approval No. 2700-0087

Solid Earth and Natural Hazards Research and Applications

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
February 4, 2002

NRA-00-OES-05
Issued November 20, 2001

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

I. GOALS OF THIS NASA RESEARCH ANNOUNCEMENT (NRA)

This announcement offers opportunities for researchers to participate in the Solid Earth and Natural Hazards (SENH) research and applications program of NASA's Earth Science Enterprise (ESE). This NRA seeks proposals for the implementation of the ESE strategy in the area of solid Earth science spanning the spectrum from research and data analysis to applications of ESE products by the end user. The primary objective of this NRA is to enhance the ability of the science community to answer specific scientific questions identified with the ESE research strategy. The NRA also seeks proposals that extend the benefits of science, data, and technology developed within the SENH program to the broader user community via applications. Appendix A describes opportunities within NASA's Solid and Earth and Natural Hazards Program in both research and applications.

NASA's (ESE) seeks an end to end application of NASA developed space and airborne technology from the characterization, understanding, and modeling of the Earth system to the application of that knowledge for the benefit of society. ESE is developing our understanding of the Earth system utilizing observations made from the unique perspective of space supported by laboratory, field, theoretical, and modeling research. The Enterprise is applying the resulting ESE science, data, and technology developed by the scientific community to end users in the federal, state, and local governments, and tribal communities.

Candidate applications proposals will support the operational mandates and decision making requirements of federal, state, and local governments, and tribal communities through public and private sector partnerships. NASA sponsored applications research and development projects will follow the "leave behind" concept. That is, the decision support systems will be fully sponsored by the partnering users following a successful demonstration of the program.

NASA and its partner, the German Space Agency (DLR), expect to launch the **G**ravity **R**ecovery and **C**limate **E**xperiment (GRACE) Earth System Science Pathfinder (ESSP) in 2002. This NRA seeks proposals for the data analysis, scientific research and modeling studies in support of the GRACE mission. We are specifically interested in the development and verification of models related to the static and dynamic components of the Earth's gravity field and the associated determination of mass distribution within the Earth system. Scientific data from the GRACE mission is expected to become available in late-2002 pending a successful launch and commissioning of the GRACE satellites.

II. THE SENH RESEARCH AND APPLICATIONS PROGRAM

A. The Research Component

The Earth Science Enterprise defines its Research Strategy (http://www.earth.nasa.gov/visions/researchstrat/Research_Strategy.htm) through a hierarchy of scientific questions which focus attention upon key elements of the Earth System. The over arching goal for the Earth Science Enterprise is to determine:

"How is the Earth changing and what are the consequences for life on Earth?".

The magnitude and scope of this question is further defined for the Research Strategy by a series of research challenges which specifically address key elements of Earth system change.

- ***How is the global Earth system changing?***
- ***What are the primary forcings of the Earth system?***
- ***How does the Earth system respond to natural and human-induced changes?***
- ***What are the consequences of change in the Earth system for human civilization?***
- ***How well can we predict future changes to the Earth system?***

The implementation of the Research Strategy focuses upon twenty three more specific questions derived from this general approach which address the variability, forcing, response, consequence, and prediction of the Earth System. This hierarchy of questions or research goals defines a pathway of "variability, forcing, response, consequence, and prediction" that provides direction and focus to the individual research programs which comprise the ESE Research Division. This structure also highlights one of the most important intellectual challenges in the study of the Earth system – that most responses of the Earth system to a forcing (either natural or human-induced) can in turn become forcing factors themselves.

The SENH program focuses most closely upon two of these 23 specific questions which address global variability and forcings. These two research questions are:

- ***What are the motions of the Earth and the Earth's interior and what information can be inferred about the Earth's internal processes?***

- ***How is the Earth's surface being transformed and how can such information be used to predict future changes?***

The SENH program defines two research themes, **Geodynamics** and **Topography and Surface Change** which seek to answer these questions by characterizing, understanding, and predicting the dynamics of the solid Earth and its interaction with the oceans, atmosphere and cryosphere.

The Geodynamics theme seeks to determine the dynamics of the Earth and the Earth's interior, and what information can be inferred about Earth's internal processes.

Our knowledge and understanding of the Earth's interior, featuring mobile tectonic plates, a convecting mantle, a magnetohydrodynamic liquid core and a solid inner core is built upon a significant foundation of space-based observations from NASA's space geodetic and geopotential field studies. Space geodesy is now a powerful tool for the study of the structure and dynamics of the Earth's interior and the deformation of the Earth's surface. Significant new NASA initiatives in satellite gravity and geomagnetic field measurement are directed toward a better understanding of the forces which drive the Earth's internal dynamics, deform the Earth's surface and influence mass and momentum exchange among the components of Earth system. For example, studies of the geomagnetic secular variation combined with Earth rotation measurements and advanced magnetohydrodynamic models of the geodynamo are yielding new insights into the decadal components of atmospheric and oceanic circulation, reversal mechanisms of the geomagnetic field, and systematic changes in the deformation of the Earth's crust. Global Positioning System (GPS), Interferometric Synthetic Aperture Radar (InSAR), and space-borne altimeter measurements of post-glacial rebound and land subsidence, coupled with time variable gravity measurements are providing more accurate characterization of glacial mass balance, a better understanding of sea level change which will lead to a more accurate prediction of the global water cycle. The SENH program in space geodetic research supports the technology, the observations, the analysis, and the infrastructure for the determination of the global geodetic reference frame that enable numerous international programs in climate research, ground, air, and orbital navigation, surveying, and numerous other civilian, government and commercial programs. The success of the SENH program in space geodesy is a strong example of the ESE "end to end" strategy to bring NASA science and technology to the broad spectrum of the scientific, civilian and government user communities.

The integrated arsenal of space based techniques including GPS, Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), gravity and geomagnetic field measurements, and advanced modeling is developing a quantitative understanding of the internal forces and responses which shape the Earth we live upon. These programs are developing a predictive capability intended to reduce the risk to society of natural hazards such as earthquakes and volcanic eruptions. The Geodynamics theme focuses its attention upon the tectonic plate boundaries which pose a significant natural risk to society because of the confluence of resources, population and tectonic activity at many locations along these plate boundaries. There is a strong link between the Geodynamics and Topography and Surface Change themes of the SENH Program because the structure and dynamics of the Earth's interior determine in large part the land surface and its interactions with the atmosphere, hydrosphere, and biosphere.

The Topography and Surface Change theme seeks to understand how the Earth's surface is being transformed and how this information can be used to predict future changes.

The Earth's surface is the interface of most importance to society. The Earth's surface is shaped by a myriad of forces both internal and external to the Earth's surface which drive sedimentation, erosion, subsidence, sea level change, tectonics, earthquakes and volcanic eruptions. An understanding of the processes that shape the Earth's crust and topography is emerging from the knowledge of the forces that drive the Earth's interior, atmosphere, and hydrosphere and the response of the Earth's lithosphere and crust to those forces. The relative importance of these various landscape-forming processes, their interactions, and their temporal and spatial variability are subjects of research within the Topography and Surface Change theme area.

The SENH program is developing a predictive capability for the Earth System forcings related to topography and surface change. SENH supports the development of space-borne and airborne techniques applied to the study of extreme events such as earthquakes, volcanic eruptions. The SENH program seeks a better understanding of spatial and temporal variability of both forces and responses including the state of stress, the rheology and structure, and the strain rate of the Earth's crust. NASA's contribution to this field of science is an integrated scientific approach which integrates space-based and airborne observation technologies with comprehensive modeling of the Earth system. NASA's unique observing tools permit large-scale measurements, support quantitative analysis, and provide a global perspective that allows comparison among different regions of the planet. The knowledge and the data sets which emerge from this scientific endeavor underscore the interconnectedness of deep and shallow solid Earth processes and the interaction of lithospheric, oceanic, and atmospheric processes.

B. The Applications Component:

The ESE Applications Program focuses on understanding priority issues that face public and private decision-makers, and determining how these issues can be addressed by the scientific and technical capabilities of ESE. The applications goal of the ESE is to **"Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology"**. "Applications" are defined as either new information services of practical value, or new uses for data, information or technology originally developed for scientific research. The specific goal of the Applications Program is to **"Turn ESE scientific and technical capabilities into practical tools for solving real world problems"**. In support of this goal, the ESE Applications Program fosters research and development to extend the benefits of ESE knowledge, data, and technology beyond the traditional scientific community based on a "leave behind" model after successful demonstration.

Implementation of the program involves the use of information derived from remote sensing technology, along with other geo-spatial technology (e.g., Geographic Information Systems (GIS) and GPS), ancillary data, and information for the purpose of improving decision-making by commercial enterprises, public agencies, public and private organizations, and/or the general public. To accomplish this objective, the Applications Program supports applications research focused on user needs and

development activities to turn NASA-developed scientific and technical capabilities into information products and practical decision-support tools for solving practical problems.

The process involves:

• identifying and understanding the cross-section of specific requirements and national needs in resource management, disaster management, environmental assessment, and community growth;
• understanding the ESE capabilities and assessing emerging science and technology results available to meet these needs;
• designing and implementing specific programs and projects to apply ESE science and technology results for the purpose of enabling innovative and effective solutions based on geospatial information to meet user needs.

Applications projects are designed and implemented through teams formed in partnerships with users. These teams typically include federal, state, and local government decision makers, university researchers, non-governmental organizations, and commercial firms that share in the development costs, and share in the responsibility of transitioning of the application into a sustainable on-going process free of long-term NASA technical and financial assistance, i.e. a concept of "leave behind" successful projects. The applications focus of this solicitation is on disaster management.

The Applications program is organized around four themes: resource management, disaster management, community growth and infrastructure, and environmental assessment. These four themes are the primary coordinate system around which sponsored activities are organized.

A three-phase evolutionary pathway that defines the applications development lifecycle includes: applications research, applications validation, and applications implementation. This is the secondary coordinate system around which sponsored activities are organized. These phases are defined below:

> **Applications research** is the first step in moving science results, data, and advanced technology from the research environment into operational use. It requires the integration of multiple elements of related scientific research and technology development results into "Applications Systems" as required to meet specific, end-user defined requirements. In order to accomplish this objective, applications research involves a close interface with the scientific research and technology development program areas of ESE. ESE applications research exploits the unique capabilities of ESE science, data, and technology to create new, geo-spatial, information products of potential utility to the public and private sectors. Instrument development is not covered by this NRA.
>
> **Applications validation** is a proof of concept phase. It comprises testing and evaluation of experimental procedures and data (from operational or experimental instruments) to assure that information products derived from those procedures

and data sets address user defined requirements and are suitable for an operational environment. Validation includes verification, calibration, and evaluation of existing algorithms, data, instrumentation, and other technology.

Applications implementation (end user) involves the transition from the confirmation function of the validation phase to the initial operational demonstration of the information goods, procedures, and technology. Succeeding routine operations and maintenance conclude this development phase and cannot be funded by NASA.

The Disaster Management theme area can be thought of as the end user application of natural hazards research and development. While natural hazards investigations may involve research, applications development, or a combination of research and applications development, disaster management investigations are, by definition, focussed primarily on applications development and demonstration.

Applications development and demonstration activities in disaster management are, by design, more practical in nature and should focus on using NASA research results, data and information, or technology in practical pre-operational or operational decision making settings. "Applications" are defined as either new information goods and services of practical value, or innovative new uses for data, information or technology originally developed for scientific research. Societal and user needs are a fundamental part of applications development, and all candidate applications proposals are required to identify and include users in the proposed investigations. The ultimate success of the proposed investigations will be judged by the satisfaction of the users with the outcome and the adoption of new products, services, or processes into routine use by the users. Potential users of disaster management information goods include disaster managers at various levels of government (federal, state, tribal, local), industry, nonprofit organizations, and the general public.

Applications projects require a cost-sharing component on the part of the partnering agency or private enterprise as described in Appendices C and D.

III. GUIDANCE FOR PROPOSERS

Details relevant to this solicitation are included in the appendices to this Announcement. Appendix A provides scientific, technical and program information for the research and modeling for which proposals are sought. Appendix B provides information regarding sources of existing data and means of acquiring new data. Applications projects require a significant cost-sharing component on the part of the partnering agency or commercial enterprise as described in Appendices C and D. Appendix C contains the specific guidance necessary for preparation of proposals in response to this solicitation. Appendix D contains general instructions for preparation of proposals in response to all NASA Research Announcements. Appendix E contains formats and forms required for proposals submitted in response to this NRA. Appendix F contains instructions for

submitting a Notice of Intent (NOI) to propose which is requested of investigators but not mandatory. A summary of research projects selected under the previous announcements may be found at the web site: http://research.hq.nasa.gov/code_y/archive.cfm.

A. ELIGIBILITY

Participation in this NASA ESE research and applications opportunity is open to all categories of domestic and foreign organizations, including educational institutions, industry, non-profit institutions, NASA research centers, and other government agencies and laboratories (including Federally Funded Research and Development Centers).

Participation by non-U.S. institutions must be proposed within the specific guidelines described in Appendices C and D, which include a no-exchange-of-funds provision.

B. JOINT RESEARCH AND APPLICATIONS PROPOSALS

Proposals that combine both research and applications within the SENH theme areas are acceptable. Such proposals will be reviewed through processes used for both research and applications proposals (e.g. such proposals will receive two independent sets of reviews from research and applications experts). Final selection of the funded proposals will be determined jointly by the Directors of the Research and Applications Divisions based upon results from both review processes.

C. COMMERCIAL DATA PURCHASE

NASA's Earth Science Enterprise has adopted commercial data purchases as a mainstream way of acquiring research-quality data, as these commercial capabilities become available. NASA encourages the use of commercially available data sets by Principal Investigators as long as it meets the scientific requirements and is cost-effective. When responding to a NASA Research Announcement the proposer should identify the commercial data sources intended for use and the associated cost.

D. AVAILABILITY OF FUNDS

Approximately $7 M per year is available for research solicited under this NRA beginning in fiscal year 2002 as outlined in Appendix A. The Division of Earth Sciences of the National Science Foundation will coordinate proposal reviews with ESE to provide approximately $500K/yr in support to grants for the geomagnetic research component as described in Appendix A. Funds for these programs in 2003 and beyond have not yet been appropriated by Congress.

E. PROPOSAL SUBMISSION AND REVIEW

1. Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/ (See Appendix F)**.

NOIs should specify whether the proposal is directed to Geodynamics, Topography and Surface Change themes of the SENH. The NOI should describe the project sufficiently such that NASA may determine whether the project is a research or an end user applications project. If NASA's airborne sensors and platforms are required for a proposed project then the sites/regions/countries to be over-flown, and the approximate time of coverage, to the nearest month(s) should be defined in both the Notice of Intent and the proposal. NASA reserves the right to redirect the proposal to programs other than that identified by the NOI or the proposal itself.

2. Proposal Content and Format

Details on the proposal format, content, and order of materials are provided in Appendix C and Appendix D. Proposers are urged to read the information in these appendices carefully and to follow the specific guidelines. Note that 20 paper copies and a digital version are required for proper submission.

3. Period of Performance

Proposals will be considered for periods of performance of up to three years.

4. Review Process

The review process and the evaluation criteria to be used are described in Appendix C, section III. Final decisions will be made promptly and proposers will be notified either by electronic mail or surface mail, or both. Proposers will receive anonymous copies of the written evaluations for their proposals.

5. Proposal Submission Dates

Proposals may be submitted at any time during the period ending at 4:30 p.m., EST, on February 4, 2002. Announcement of final selections for all components of this NRA is anticipated by no later than September, 2002. Award start dates are anticipated for 1-2 months after the selection is announced.

F. ADDITIONAL INFORMATION

If electronic access is not available to the prospective proposers, a hard copy of relevant reference(s) can be requested by calling (202) 358-3552 and leaving a voice mail message. Please leave your full name and address, including zip code, and your telephone number, including area code. Appendix F provides instructions for submitting notices of intent to propose electronically. *Prospective investigators are urged to read the information in all of the appendices carefully and to follow the specific guidelines therein carefully.*

The following items apply only to this announcement.

Identifier:	NRA-01-OES-05
Submit Proposals to:	SENH NASA Peer Review Services, Code Y 500 E Street, Suite 200 Washington, DC 20024-2760 ***(For overnight mail delivery purposes only the recipient telephone number is (202) 479-9030.)***
Number of Paper Copies:	20
Electronic Version Required :	MSWord or pdf file format provided on 3.5 inch floppy, CD, or Zip Disk
NASA Selecting Official: (Research related)	Director, Research Division Office of Earth Science
NASA Selecting Official: (Applications related)	Director, Applications Division Office of Earth Science
Principal Point of Contact:	Dr. John LaBrecque, Manager Solid Earth and Natural Hazards Program Mail Code YS NASA Headquarters Washington, DC 20546 Telephone: (202) 358-1373 FAX: (202) 358-2770 jlabrecq@hq.nasa.gov
Other Points-of-Contact:	Dr. Timothy Gubbels Applications Program Scientist

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Your interest and cooperation in participating in this opportunity are appreciated.

Original Signed by

Dr. Ghassem R. Asrar
Associate Administrator for Earth Science

Enclosures:
Appendix A- Research and Applications Opportunities in the Solid Earth and Natural Hazards Program
Appendix B- Available data sets
Appendix C- Amendatory guidance to the general guidelines contained in Appendix D and applicable only to this NRA.
Appendix D- Instructions for Responding to NASA Research Announcements
Appendix E- Proposal Cover Sheet, Required Declarations, and Budget Summary Form
Appendix F- Instructions for Submitting Notices of Intent to Propose Electronically

APPENDIX A

RESEARCH AND APPLICATIONS OPPORTUNITIES IN THE SOLID EARTH AND NATURAL HAZARDS PROGRAM

Proposals are accepted in response to the following scientific questions and applications topics. Researchers are encouraged to cite within their proposal and abstract the program components that the research will address and its relevance to NASA's research and applications strategies as a guide in the processing and decision making process. NASA does reserve the option to assign proposal reviews to other programmatic elements according to its strategic goals.

A. Geodynamics: *What are the dynamics of the Earth and the Earth's interior, and what information can be inferred about Earth's internal processes?*

1. Geopotential Field Studies: The SENH program benefits from a number of collaborative missions with international partners to provide GPS remote sensing, gravity and geomagnetic field measurements. These missions include the U.S.-Danish Ørsted, the U.S.-South African Sunsat, the U.S.-German CHAMP, the U.S.-Argentine Satelite de Applicaciones Cientificas-C (SAC-C), and the U.S.-German Gravity Recovery and Climate Experiment (GRACE). Appendix B provides a list of URLs where these missions and data access options are defined. This announcement encourages the submission of proposals for the analysis of these data sets. An emphasis of this announcement is the selection of a GRACE science team for the development and verification of static and dynamic gravity models for the GRACE Earth System Science Pathfinder (ESSP) mission.

Three advanced gravity missions are scheduled for launch this decade. These are CHAMP (launched July 15th, 2000), GRACE (to be launched in 2002) and ESA's Earth Explorer Gravity Field and Steady-State Ocean Circulation (GOCE) (in the planning stage). The gravity field and geomagnetic fields are formally and theoretically related to changes in earth orientation and the terrestrial reference frame because temporal changes in the gravity field and geomagnetic secular variation are manifestations of changes in mass distribution within the solid Earth, oceans, cryosphere, and atmosphere. Furthermore, both gravity and earth orientation measurements complement studies of mass transport that are obtained by other methods such as general circulation, hydrology, earthquake, and magnetohydrodynamic models.

GRACE ESSP Data Analysis and Research Investigations: The GRACE (Gravity Recovery And Climate Experiment) Earth System Science Pathfinder mission is an innovative and advanced technology mission to measure the static and time varying components of the gravity field. The Earth's gravity field observed from space is largely a consequence of the mass distribution within the Earth system. Changes in the gravity field are a consequence of the movement of mass within the Earth system.

Therefore measurement of the changes in the gravity field will provide us with a clearer vision of the dynamics of the Earth system and its individual components. The GRACE mission is currently scheduled for launch 2002. It is expected that data from the GRACE mission will become available in mid to late 2002. The GRACE project team expects to produce complete high resolution gravity field models at spherical harmonic degree and order exceeding 100, every few weeks. The GRACE data set should permit inferences about changes in equivalent surface loads of less than 1 gm/cm^2 with a spatial resolution on the order of a thousand square kilometers or better. The GRACE mission is a multidisciplinary program with expected contributions to solid Earth science, cryospheric science, physical oceanography, continental hydrology, and atmospheric sciences. The high resolution static and temporal gravity field will provide unique opportunities to study global circulation, and hydrologic transport, the internal structure and dynamics of the Earth, and might contribute to the mitigation of flooding and drought through a better understanding of the regional distribution of water.

This NRA seeks proposals to support the development of new data analysis methods, and models leading to the widest exploitation of gravity field observations to be made by GRACE for the study of a broad range of cross disciplinary Earth system science issues. Due to the extreme sensitivity of the GRACE measurement technique, ground calibration of the mission is problematic. Validation of both the global and regional gravity signals determined by GRACE will be of considerable importance. This NRA therefore seeks proposals which provide unique measurements and predictive models for the static and time varying gravity field which can be used to verify the GRACE space-borne observations. Proposals are encouraged which are multidisciplinary in scope and which address the Earth System Science questions defined in the Science Research Strategy. We seek improved models for the static gravity field, and its short term and secular variations and their influence upon the terrestrial reference frame. We seek proposals for the separation of signals due to atmospheric, hydrospheric, cryospheric and solid Earth mass fluctuations which are likely to influence the GRACE observations. The analysis effort can include other data sources which complement the GRACE measurements such as Earth rotation and temporal and static gravity field measurements, and other innovative approaches including the use of data from other satellite missions such as CHAMP and Laser Geodynamics Satellite (LAGEOS) gravity, Topex-Poseidon, Jason, and IceSat altimetry, and the Shuttle Radar Topography Mission (SRTM).

Geomagnetic Field Studies: The SENH program supports a number of current and past missions to measure the Earth's geomagnetic field. The Magsat, Ørsted, CHAMP and SAC-C satellites provide a rich resource for the study and applications of the geomagnetic field. One requirement of the geomagnetic field program is the separation and modeling of magnetic sources both internal and external to the solid Earth. The objective in the modeling of the external field is to improve the resolution of the structure and dynamics of the solid Earth system. The ionosphere for example generates a significant signal within the observed magnetic field that both limits the resolution of the Earth's lithospheric field but this ionospheric signal can also be used

to sound the Earth's interior utilizing space based magnetotelluric techniques. The Oersted, CHAMP and SAC-C missions combined with developing global and regional networks of GPS receivers provide a vast new resource for the study of ionospheric dynamics related to this external geomagnetic field signal. Proposals are encouraged which seek to utilize these new data sets to better understand the structure and dynamics of the solid Earth through improved separation of field components and the resolution of ionospheric dynamics related to vertical motions of the Earth's surface. This NRA seeks proposals for magnetohydrodynamic models of core processes, magnetic anomaly analysis related to the temporal and spatial variability of the internal component of the geomagnetic field, the development of space-borne magnetotelluric sounding techniques, separation of sources and comprehensive models of the geomagnetic field, and space-borne magnetometer design.

The Division of Earth Sciences at the National Science Foundation has offered to review and possibly co-fund some proposals which utilize geomagnetic satellite data. The review process for these proposals will be coordinated with the National Science Foundation Geophysics Program. It is anticipated that NSF cost share and fund on the order of $500,000/yr for three years in support of selected proposals in geomagnetic field research.

Definition of the Oersted, CHAMP, and GRACE Science Data Analysis: The Science Investigations selected in this solicitation will join the current GRACE Science Team. The GRACE science team members and other investigators selected via this NRA for the conduct of gravity, geomagnetic, and GPS research will also be nominated as members of the Oersted, CHAMP and SAC-C science teams according to the nature of their projects. These membership designations allow NASA to request access to the data sets of these satellite missions for these science teams as per Memoranda of Understanding between NASA and its international partners supporting these missions.

2. Earth Rotation and the Terrestrial Reference Frame: A significant component of the Geodynamics theme is the determination and study of earth rotation and the terrestrial reference frame and the attendant space geodetic techniques. The SENH program plays a leading role in the development of the space geodetic technology, the global networks for geodetic GPS, VLBI and SLR systems, and the analysis techniques associated with these data. Earth rotation (including length of day, polar motion, precession and nutation, and geocenter location) is a fundamental description of the Earth and provides unique information on the change in mass distribution within the Earth system over all observable time scales. This component of space geodesy is critical to understanding the internal dynamics of Earth and the interaction of the solid Earth with the atmosphere, oceans and cryosphere. Changes in angular momentum provide information on the mass transport within the Earth System and the frictional drag forces between the various components of the system. There is therefore a formal and theoretical link between changes in the rotation of the Earth, static and dynamic gravity and the geomagnetic field.

The terrestrial reference frame is critical to understanding the dynamics of the Earth's surface and the correct positioning of many physical measurements taken upon the Earth's surface including sea level change, crustal deformation, volcanic inflation, ice surface, and coastal zone or flood plain topography and change. Geographic Information Systems rely upon an accurate and up to date Terrestrial Reference Frame as they take on an increasingly important role in the depiction and analysis of scientific, civilian, and military data. This increasing reliance upon space geodesy will continue. Geodetic science and technology must keep ahead of societal requirements in the accuracy of the reference frame and the improvement in related technologies. The area of geodesy and associated positioning technology is a candidate for applications related research and development. Proposals for continuation of current studies and innovative new techniques in the measurement and analysis of Earth Rotation and related space based techniques are encouraged.

B. Topography and Surface Change: ***How is the Earth's surface being transformed and how can this information be used to predict future changes?***

The Topography and Surface Change theme seeks to characterize, understand, and predict (model) the forces and responses which shape the Earth's surface and to apply that knowledge to the study of natural hazards and the improvement of disaster management decision making.

This NRA encourages submissions which study the application of airborne and space based techniques which utilize or build upon existing NASA capabilities to support the study of natural hazards. Natural hazards investigations, while grounded in earth science research and listed here under the Topography and Surface Change research theme, may involve research, applications development, or a combination of research and applications development. NASA's mission is to lead the development and application of space-based technologies. Proposals involving InSAR and geodetic GPS technologies are encouraged but must show exceptional promise of advancing our understanding of, demonstrating the practical use of, or significantly improving these new technologies for geodetic measurements and monitoring of the Earth's surface for the development of disaster management tools. Of significant interest are applications for the capabilities of the Southern California Integrated GPS Network (SCIGN) and similar GPS networks, the SRTM topographic data base, and Light Detection and Ranging (LIDAR) mapping technologies although proposals need not be limited to these systems. In a joint resolution NASA, the Russian Academy of Science and the Russian Space Agency have identified as natural laboratories for crustal dynamics and volcano research the Western U.S., Tien Shan Mountain region of Southern Asia, and Kamachatka-Kuril-Aleutian region of the Northwestern Pacific. Proposals which build upon and utilize existing infrastructure or data acquisition capability in these regions are encouraged.

GPS field campaigns and permanent GPS stations are effective tools for studying the temporally-continuous nature of deformation related to tectonics, sea level change, earthquake hazards, ground subsidence, and other phenomena. NASA supports global GPS infrastructure through the IGS (International GPS Service), and regional GPS

infrastructure through the SCIGN array in Southern California and other GPS networks. NASA also supports the development of INSAR as a tool for spatially-continuous remote sensing of deformation as an observation technique complementary to surface GPS receivers. The aim is to understand the spatial and temporal variability in strain accumulation for active tectonic regions in order to better understand for example, mechanisms of deformation and the earthquake cycle or the predictability of volcanic eruptions. Both airborne and space based LIDAR systems in conjunction with radar, hyper and multi-spectral optical techniques are emerging as high precision topographic mapping tools as well as effective systems for the estimation of surface geology and biomass.

1. Natural Hazards: One of the goals of Topography and Surface Change research is the prediction of surface change which will lead to the reduction of risk associated with natural hazards and losses associated with natural disasters. The research-to-applications objective of NASA's SENH program provides for the development of techniques and their demonstration through to the implementation of operational systems.

The extreme events which pose as natural hazards to society often provide unique insights into the physics of earth processes and therefore advance our predictive capabilities. A discussion of some of these extreme events follows:

a. Earthquakes: Earthquakes pose a significant challenge to modern society from the loss of life, the disruption of economies, to the allocation of resources for mitigation and response. Space based techniques such as GPS networks, InSAR, and multi or hyperspectral imaging now offer an unprecedented view of the earthquake cycle and previously unobserved dynamics of the Earth's crust. NASA's long term goal is to develop forecasting techniques for earthquake risk on time scales short enough for the useful mitigation of the earthquake hazard. This NRA encourages proposals that develop techniques which contribute to a better understanding of crustal dynamics for the mitigation of earthquake risk and the response to earthquake related disasters.

b. Coastal Hazards: The near-shore coastal environment is subject to geologic, ecologic, oceanographic and meteorologic factors which can lead to extreme storm surges, regional subsidence, flooding, erosion, and regional bathymetric changes due to sediment redistribution. Sea level change also poses a long term hazard to the coastal zone. The measurement of global sea level change is recognized as a challenging and significant multidisciplinary problem. This research announcement solicits interdisciplinary proposals which make use of space-based and airborne observations to determine the rate and acceleration of global sea level change and the impact of sea level change and severe storms on the coastal environment. Examples of space-based observations include GPS vertical control of tide gauges, satellite and airborne topography and related coastal zone measurements.

NASA seeks to establish a few pilot studies which utilize space based or airborne technologies to further our understanding of coastal processes, assess the risk and evaluate and understand geomorphic effects of seasonal and extreme storms, and to

assess the potential effects of sea level change and land subsidence on the coastal environment. Geodetic technique development aimed at more accurate measurement of sea level change is also encouraged.

c. Flooding: Of all natural hazards, floods consistently rank among the highest in terms of property damage and loss of life, both nationally and internationally. Despite improved understanding of weather and its predictability, and the existence of sophisticated flood warning systems, flood losses continue to rise. Recent and planned missions such as SRTM, GRACE, ICESAT, and Shuttle Laser Altimeter (SLA-1,2,3) space-borne and airborne radar, lidar and imaging systems can provide more accurate and complete information critical to improvement of flood risk and vulnerability assessment, response, and consequence and impact assessment.

Opportunities exist for reduction of flood hazards through two broad strategies: a) improved estimation of flood risk; and b) improved real-time forecasting of floods, and associated warning strategies. Both efforts will be aided by better scientific understanding of the watershed and flood plain as an integrated system. Proposals that utilize NASA data in flood plain modeling and flood forecasting are particularly encouraged. Proposed work should focus on remotely sensed or derived parameters such as precision topography, land cover and land use dynamics, recent regional and temporal rainfall history, soil moisture, snow cover (and water equivalent), and snow melt.

It is expected that research and developmental activities will constitute the central focus of this activity, and all proposals are expected to have a strong science focus; for example, they should develop or use information about the physical mechanisms that lead to floods, rather than just describing flood events. Strong emphasis should be placed on the utilization of recent and planned Earth Science space-borne and airborne missions. Cooperation with disaster management practitioners such as FEMA and/or local/regional flood management agencies, are considered appropriate and encouraged. These studies should aim to determine the utility and limitations of key remote sensing parameters and/or time series observations for improved monitoring, forecasting of the locations and severity of flooding, and/or assessing the vulnerability to flooding in watersheds.

d. Landslides: NASA's aim is to better understand both landslide processes, including initiation and propagation of slides in different geological, geographical, and meteorological settings, and increased risk of landslides that may result from changes in rainfall and soil moisture. NASA encourages the use of remote sensing data for assessment, mitigation and warning of landslide risk and vulnerability assessment, response, and consequence and impact assessment. These efforts will benefit from improved knowledge of hillsides as integrated, dynamic systems. Proposals are encouraged which have a strong research and development focus aimed at the physical mechanisms that lead to landslides. Research and applications development in the area of land subsidence will also be considered under this category.

e. Volcanic Hazards: Many volcanoes experience changes in the days to months prior to eruption, in surface deformation, seismicity, gas and thermal flux. Of the 600 or so active volcanoes, less than 20% are monitored, even with rudimentary surveys, due to their logistical or hazard-related problems. Remote sensing and space geodetic systems can be the only practical means of acquiring data to study volcanoes and monitoring their activity.

New capabilities to monitor eruption precursory activity at a volcano are under development at NASA. These techniques include remote sensing of thermal and gas fluxes, and the measurement of ground deformation using space geodetic techniques such as GPS arrays and InSAR. Co- and post-eruptive hazard assessment and monitoring techniques involving the use of remote sensing, and digital topographic data are also ongoing. A reasonably broad range of related investigations has already been funded under previous announcements, and NASA is likely to support only a few new highly innovative proposals in this area. Topics of specific interest to this solicitation include the use of remote sensing and geodetic techniques to understand the geologic controls on eruption processes, determination and understanding of eruption recurrence intervals, the nature and dynamics of magmatic plumbing systems, lava/ash emplacement and remobilization processes, and the consequences of volcanic eruptions on short term climatic phenomena.

f. Wildfires: Within the United States over the last decade, wildfires have grown substantially in importance as a major natural hazard. The catastrophic fires of the summer of 2000 dramatically illustrated the magnitude of the problem, with over 10 million acres burned over an extended fire season. It has become obvious that, in many areas, the effectiveness of fire supression efforts of previous decades is partly a cause of the problem. The intense El Niño of 1997-98 led to major wildfire devastation on all continents except Antarctica. In tandem with the growing importance of the phenomena over the last decade, NASA's space-borne and airborne systems have made great strides developing capability to characterize wildfire location and intensity. In addition sponsored research projects within NASA's Land Use and Land Cover Change program have yielded much new knowledge concerning the phenomenon and its impacts, across a variety of time and space scales.

NASA encourages the submission of proposals which address the development of tactical models for wildfire development utilizing local weather conditions and topography, and development of short-term regional vulnerability assessment. Other methods we wish to advance include the use of geophysical parameters observed or inferred from sources that include remote sensing (e.g. Normalized Difference Vegetation Index (NDVI) for fuel load estimation, classification techniques for vegetation type, soil and plant moisture estimates for fuel hydration, and meteorology). Cooperation with operational organizations with responsibilities in these areas is strongly encouraged. Proposals should demonstrate the utilization of NASA derived data sets and resources.

2. Applications of SRTM and GPS networks: As discussed above, the SRTM mission and the SCIGN network are examples of SENH programs which will begin providing significant new data sets in the coming year. Each has been the subject of previous solicitations however the importance of both the space topography and the new GPS networks is sufficient to again encourage the submission of new or renewal proposals to exploit these resources.

a. Shuttle Radar Topography Mission Data Analysis: NASA in cooperation with the National Imagery and Mapping Agency, German space agency (DLR) and the Italian space agency (ASI) cooperated in the Shuttle Radar Topography Mission. Launched on February 11, 2000 the SRTM provided L Band and X band topographic radar mapping for over 80% of the Earth's surface between approximately 60˚ N Latitude and 57˚ S Latitude. For more information, please see http://www-radar.jpl.nasa.gov/srtm. The data processing is proceeding according to schedule with significant data availability to the research community in 2002. It is recognized that the release of SRTM data has been delayed however it is expected that SRTM data will become available within the first full year of funding (2002) for this NRA. Submission of renewal proposals for those selected in the SENH99 announcement are encouraged to maintain continuity of research and applications projects but these renewals will be reviewed and evaluated without preference over other proposals.

This research announcement particularly encourages proposals for the development of end user applications using SRTM data, collaborations with government and civilian user communities is encouraged. Cost sharing in the end user applications is a strong requirement of the Applications Program for selected projects. NASA will also consider proposals that address SRTM radar phenomenology and data/product characterization, verification and validation, and enhanced processing techniques. SRTM data validation studies may propose field and/or aircraft campaigns as necessary although the use of existing or leveraged data sources such as other remote sensing space-borne or airborne data sets is strongly encouraged.

b. Southern California Integrated GPS Network and similar geodetic networks: The SCIGN network deployment was completed in July, 2001. This NRA seeks proposals to develop both research and end user applications for SCIGN and other GPS geodetic networks in natural hazards research, disaster management and other governmental and civilian applications. Although investments in new hardware may be supported, this investment will be limited to enhancements of existing networks and should focus upon the development of new technologies and information systems which increase the utility of GPS data networks to research or disaster management activities such as real time data transfer, higher accuracy, integrated modeling etc. Applications of regional GPS networks to studies in the geodynamics theme areas such as the study of ionospheric disturbances related to seismic or geomagnetic phenomena are encouraged.

C. Disaster Management and Natural Hazards Applications:

This NRA seeks to apply the knowledge, data, and technology derived from the Solid Earth sciences and other ESE research programs to the study of natural hazards and the management of natural disasters. This NRA also welcomes innovative applications of NASA developed capabilities to assess risk and provide disaster management tools for human induced disasters such as the attack on the New York City's World Trade Center. Implementation of the program involves the use of primary information derived from remote sensing, in situ measurements, and comprehensive models for the purpose of improving decision-making by commercial enterprises, public agencies, public and private organizations, and/or the general public. Applications development projects solicited through this announcement should draw upon data sets, technology and science derived from the ESE sponsored research and development, including, but not limited, to the Solid Earth and Natural Hazards program.

Applications proposals in disaster management and natural hazards may address any of the natural hazards described in the previous section and may also consider manmade disasters of appropriate scale, the impacts of climate variability on hazards and disasters, as well as the impacts of severe storms.

The proposed applications activities may extend work already completed or proposed or drive new investigation activities. In either case, the proposed applications projects will provide a methodology through which specific outputs from ESE research and development can be used to derive information products and services for practical use in the field of disaster management and/or natural hazards/disaster management decision support.

Specific disaster management task categories include risk and vulnerability assessment, response, and consequence and impact assessment. These tasks may be combined; applications respondents to this NRA must identify the task category. Applications respondents should also identify the phase of applications development that the proposed investigation applies to: applications research, applications validation, or applications implementation. Investigations may span multiple phases of development. In addition, all proposals should clearly define the new information goods and services of practical value to be produced, or innovative new uses for data, information or technology to be investigated.

Descriptions of currently sponsored or recently completed sponsored applications projects in this area can be accessed at http://www.earth.nasa.gov, under the "Practical Applications" hyperlink. Many of these studies are funded by or co-funded with the research division. The ultimate assignment of a grant to either research or applications support will be determined by NASA.

As described above, in order to qualify for funding, applications proposals must utilize NASA-developed data, information, services, or technology. Applicants should not limit their investigations to these resources, however, and are strongly encouraged to also

utilize resources derived from the commercial sector, such as remotely sensed data, other geo-spatial information, and commercial software/models/modeling tools. The involvement of the commercial sector, where appropriate, is encouraged.

APPENDIX B

AVAILABLE DATA SETS

Proposers are encouraged to review the existing data bases and acquisition resources before requesting the development of new data resources.

NASA's policy is to work cooperatively with other U.S. government agencies and our international partners in the development of a comprehensive capability to observe and understand the Earth. In addition, both U.S. National and NASA policy require NASA to support private-sector investment in commercial space activities by committing the U.S. government to purchase commercially available goods and services. NASA will not develop a mission that in any significant way competes with or duplicates planned commercial capabilities.

Costs for any other types of required data also should be identified in the budget request.
Information about data available under the Earth Science Scientific Data Purchase can be found at: http://www.crsp.ssc.nasa.gov/databuy/dbmain.htm

NASA seeks to make its aircraft-based remote sensing capabilities and data sets available to a broad community of scientists, including those funded by other agencies. Therefore, this announcement invites proposals for limited acquisition of AVIRIS, MASTER, AIRSAR, or other NASA aircraft instrumentation from investigators in other Federal agencies. Funding from the partnering agency for the acquisition and analysis costs of the airborne data is required unless otherwise agreed to by NASA.

Proposals which anticipate the use of UNAVCO resources for GPS support must include a 'UNAVCO requirements' sheet as part of their budget. The information required is listed in Appendix E. UNAVCO support expenses are budgeted separately by NASA but are considered in deciding the overall cost-effectiveness of the proposal.

The following is a partial listing of internet addresses which will provide additional information on strategic plans, missions, data networks, instruments, and data systems that are of relevance to the SENH NRA for 2001. Additional information can be obtained by contacting the program officials listed in Section F of the main body of this NRA.

Strategic Plans and Program Information

NASA Earth Science Enterprise Home Page:
http://www.earth.nasa.gov/
Science Implementation Plan
http://www.earth.nasa.gov/visions/researchstrat/Research_Strategy.htm
NASA Earth Observatory Web Page
http://earthobservatory.nasa.gov/

Missions, Networks and Instruments

Shuttle Radar Topography Mission and other topographic data:
http://www.jpl.nasa.gov/srtm/
http://www.geo.ed.ac.uk/home/ded.html
http://edcdaac.usgs.gov/main.html

Gravity and Climate Experiment (GRACE)
http://www.csr.utexas.edu/grace/

Southern California Integrated GPS Network
http://www.scign.com/

SAC-C
http://www.conae.gov.ar

CHAMP
http://www.gfz-potsdam.de/html/projekte.html

Oersted
http://www.dsri.dk/Oersted/
http://www.dmi.dk/eng/f+u/index.html

Earth Observing System Instrument Home Pages:
http://modarch.gsfc.nasa.gov/MODIS/
http://terra.nasa.gov/
http://geo.arc.nasa.gov/sge/landsat/landsat.html

LIDAR- Shuttle Laser Altimeter 1 &2 (SLA) and SLICER airborne data
http://core2.gsfc.nasa.gov/lapf/

International GPS Service (IGS)
http://igscb.jpl.nasa.gov/

International Laser Ranging Service (ILRS)
http://ilrs.gsfc.nasa.gov/ilrs_home.html

International VLBI Service (IVS)
http://ivscc.gsfc.nasa.gov/

Data Systems

Crustal Dynamics Data Information System (CDDIS)
http://cddisa.gsfc.nasa.gov/cddis_welcome.html

GENESIS GPS ESIP
http://www-genesis.jpl.nasa.gov/html/index.shtml

NASA CRSP Home Page:
http://www.crsp.ssc.nasa.gov/databuy/dbmain.htm

NASA Airborne Science Program:
http://www.dfrc.nasa.gov/airsci/

NIMA DTED-1 data availability
Contact: Steve Kempler
GSFC DAAC
kempler@eosdata.gsfc.nasa.gov
(301) 614-5765

APPENDIX C

AMENDATORY GUIDANCE TO THE GENERAL GUIDELINES CONTAINED IN APPENDIX D AND APPLICABLE ONLY TO THIS NRA AND INSTRUCTIONS FOR PROPOSERS

I. PURPOSE

These guidelines contain general and specific information regarding the submission of proposals in response to this NRA. Formats for submission of proposals for research related to this program are provided. The evaluation criteria are specified. Appendix D contains general instructions for responding to NASA Research Announcements. Where conflicts exist between this appendix and Appendix D, this appendix shall be the controlling document.

II. PROPOSAL CONTENT AND FORMAT

The proposal should provide sufficient detail to enable a reviewer to assess the value of the proposed research, its relation to the objectives of the NRA, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources and schedule. Capabilities of the proposing organizations should be described including the experience of the Principal Investigator and any Co-Investigators. The technical part of the proposal should be limited to the equivalent of 15 pages of text**,** single-spaced, with type no smaller than 12 pt. A reasonable number of figures and tables (not to exceed 4 pages) may be appended. Short resumes and statements of current and pending research funding (including proposal name, funding agency, duration, and total funding) for all investigators should be included. The cover sheet, table of contents, abstract, list of references, management plan, cost plan, resumes, and statements of current and pending funding need not count in the technical plan page limit. The proposal should be self-contained, and should not refer reviewers to external sources or web-sites for critical information. Additional pertinent information (e.g., reprints, letters indicating the commitment of co-investigators and collaborators or international partners) may be added as appendices. If color is used, proposers should ensure that all copies have color. Proposals should not be bound or in covers.

Twenty paper copies and one digital version are required for submission. The digital version should be in MSWord or pdf file format and recorded on 3.5 inch floppy, CD, or Zip Disk format.

A. PAGE LIMITS

Offerors should adhere to the following page limit recommendations:

Cover Letter	1
Cover Page	1 - 2

Table of Contents	1
Abstract	1
Technical Plan	15
References	1 - 2
Management Plan	1 – 2
Cost Plan	3 - 8
Current and Pending Research	1 – 2 per investigator
Resumes	1 - 2 per investigator
Other	As few as possible

B. CONTENT

Each proposal should contain the following materials assembled in the order given.

1. Proposal Cover Page. A proposal cover page is required to be submitted both, in hard copy, and electronically. Please see Appendix E. The NRA component (i.e., research area) addressed by the proposal should be indicated on the cover page. In most cases, only one research area should be indicated; however, joint science and applications proposals will be welcome for joint review. *Please note that the budget request to be summarized on the cover page should be for the entire investigation, totaling the budget requests for all institutions participating in the proposal.*

3. Table of Contents (recommended length: 1 page). A table of contents listing the page numbers for key sections of the proposal, including the cost and management plans, should be provided.

4. Abstract (length must not exceed 1 page). The abstract should summarize the research proposed in one page or less. It should contain a simple, concise overview of the investigation, its objectives, its scientific approach, expected results, and the value of its results to NASA's SENH NRA efforts. It is very important that this abstract be specific and accurately represent the research to be conducted.

5.Technical Plan (length must not exceed 15 pages). The main body of the proposal should contain a full statement of the research to be undertaken and should describe key background, objectives, scientific or applications relevance, technical approach, and expected significance of the work. The key elements of the project should be clearly identified and related to each other. The methods or approaches to be used should be described, and, as appropriate, the advantages of the selected methods or approaches over alternatives should be discussed. The anticipated results should be identified and their relation to the proposal's stated objectives and NASA's objectives, as outlined in the NRA, should be discussed. The research should be described in sufficient detail that peer reviewers can adequately assess the scientific methods and quality of the work proposed. Where resources from satellites or other data sources (e.g., aircraft sensors) are required, proposals should indicate whether a commitment has been made for access to the other systems or whether the required/desired data are available. The costs for such data

should be included in the cost plan. The plan should also describe how any data products to be created or additional, ancillary data sets to be obtained will be shared with NASA, other investigators, and the broader scientific and user communities.

6. References (recommended length: 1-2 pages). A complete list of references cited in the technical plan must be provided. Each reference should include the title, names of all authors, book or journal, volume number, page numbers, and year of publication. While it is important to be concise, proposers should follow accepted scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal.

7. Management Plan (recommended length: 1/2 - 2 pages, depending on complexity). The Management Plan should outline the roles and responsibilities of all investigators and collaborators and indicate the relationships among these roles and responsibilities within the group. The management plan should also identify what contractor and/or non-institutional support is anticipated and who will be providing it. A schedule for reporting results and publishing papers should be described.

FOR END USER APPLICATIONS PROPOSALS ONLY: the management plan must include a description and analysis of how application implementation will transition from development to operations. The plan should indicate how operational support will be provided when NASA assumes a non-funding role in the project, and a plan for on-going operational support.

8. Cost Plan for U.S. Proposals Only. Please see Appendix D for additional guidance and Appendix E for forms. Contributions from any cost-sharing plan or other support for the proposed research should be detailed.

For applications proposals, the inclusion of a cost sharing plan is strongly encouraged. Cost-sharing will be a significant element of the evaluation.

Costs for the acquisition, purchase, storage, or processing of all required data should be included. Also, costs for modeling, if proposed, should include all aspects of the process from writing software through computer operations and time. If use of NASA or other supercomputer resources is anticipated, an estimate of computational requirements should be included as part of the budget submission. Requirements for any data from NASA's commercial data buy should be clearly specified. Full costs for the purchase of data from commercial sources should be included in the budget and the requirement documented in the proposal.

9. Summary of Current and Pending Funding. A list of current and pending research funding, to include the proposal name, funding agency, duration of research project, and total funding level, for all investigators should be included. NSF form 1239 may be used and accessed at: http://www.nsf.gov/pubs/2000/00form1239/00form1239.doc .

10. Resumes. Brief resumes (1-2 pages) for all named investigators should be appended to the proposal.

11. Other Enclosures. Any other material pertinent to the consideration of the proposal may be attached as an appendix. This might include preprints or reprints of relevant publications, background on new measurement or analysis approaches, or letters of support and/or participation by scientists and/or institutions. However, reviewers will be under no obligation to read this material, so critical information should be included in the main body of the proposal. Inclusion of general materials that will not aid in the evaluation of the proposal is specifically discouraged.

III. SELECTION PROCESS AND EVALUATION CRITERIA

The review of proposals submitted under this NRA will consist of a full peer review including external reviewers, which may involve a mail review, a panel review, or both. This will be followed by a programmatic review in which NASA managers will assess program balance across the competitive-range proposals and evaluate any logistical, implementation, cost, and/or management concerns.

Proposals that address science will be reviewed by scientific experts. Proposals that address applications will be reviewed by persons familiar with the application and operational use of remote sensing, GIS, and related technologies.

A. EVALUATION CRITERIA

The criteria listed below will be used in evaluating individual proposals. These criteria supersede those listed in section (i) of Appendix D, and are of approximately equal importance.

1. The intrinsic merits of the investigation, including:

   (a) the overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

   (b) the qualifications, capabilities, and relevant experience of the Principal Investigator and any Co-Investigators or collaborators as an indication of their ability to carry the investigation to a successful conclusion within the requested resources, including timely publication of peer-reviewed journal articles.

   (c) the adequacy of facilities and ability and commitment of the investigator's institution to provide the necessary

support to ensure that the investigation can be completed satisfactorily.

FOR APPLICATIONS ONLY: (d) end-user involvement in project initiation, requirement definition, and application evaluation and testing, and participation of the private sector in data acquisition, product development, and operations.

2. The relevance and responsiveness of the proposed research to the goals and objectives of NASA's Earth Science Enterprise and to the goals and objectives described in this NRA, including:

(a) the probability of achieving one or more significant objectives directly relevant to the research areas identified in this NRA.

(b) the soundness, logic, and practicality of the proposed technical methods and concepts for achieving successful results.

(c) the potential benefits to future U.S. Earth Science missions or data purchases.

(d) the quality, effectiveness, and appropriateness of the management plan.

FOR APPLICATIONS PROPOSALS ONLY: (e) the quality, effectiveness, and appropriateness of the applications approach, including: (1) national importance, (2) pervasiveness, (3) uniqueness of NASA ESE contribution, (4) partnership investment/involvement, (5) documentable results, and (6) commercial impact.

3. The cost of the investigation, including consideration of the realism and reasonableness of the proposed cost, the relationship of the proposed cost to available funds, and the potential value of the research results (i.e., cost/benefit) to the user community. ***(FOR APPLICATIONS ONLY: (also) the degree of cost sharing among project participants and, the soundness of the funding plan for transition from application implementation to operations.)***

B. OTHER CONSIDERATIONS

NASA reserves the right to select and make an award covering only a portion of a proposer's investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance. In cases in which two or more proposals address similar problems and/or adopt similar approaches to data analysis, NASA may desire joint participation on the part of two or more proposers in a single project. If such overlap involves more than one funding organization, NASA and those organizations will confer and mutually agree to the disposition of those proposals.

Any negotiations prior to final decisions will occur only after the peer review of proposals has been completed. The final decisions will be made by the NASA selecting official(s) based on the results of the peer review and programmatic considerations, including the program's focus, goals, and balance. Final decisions will be made promptly and investigators will be notified by either electronic mail or surface mail, or both. Proposers will receive anonymous copies of the reviews for their proposal(s).

APPENDIX D

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

NASA Federal Acquisition Regulation (FAR), Supplement (NFS) Part 1852.235-72, Effective JANUARY 2000

(a) **General.**

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) **NRA-Specific Items.**

Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) **Transmittal Letter or Prefatory Material.**

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;
(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;
(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
(vi) Identification of the NRA, by number and title, to which the proposal is responding;
(vii) Dollar amount requested, desired starting date, and duration of project;
(viii) Date of submission; and
(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the cover page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in *[insert page numbers or other identification]* of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description.**

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and -arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants,

together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs (U.S. Proposals Only).**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit organizations).

(iv) Use of NASA funds--NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) **Security.** Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals.**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Text of the proposal including figures and references must not exceed 15 pages. Necessary detailed information, such as reprints, can be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals.**

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances,

simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

(i) **Evaluation Factors.**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

(j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA and, if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or
(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) **Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

(n) **Cancellation of NRA.**

(1) NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

APPENDIX E

PROPOSAL COVER PAGE, REQUIRED DECLARATIONS, AND BUDGET SUMMARY FORM

Required Proposal Forms

Two proposal cover pages are required as part of the proposal. The first is a **hard copy** which is required as part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. This authorizing signature also certifies that the proposing institution has read and is in compliance with the required certifications printed in full in this Appendix; therefore, each individual certification does not need to be signed and submitted separately.

The second proposal cover page must be submitted **electronically** to the SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**. If the proposer has submitted an electronic NOI to SYS-EYFUS, the same user UserID and password can be used to complete the electronic proposal Cover Page. SYS-EYFUS will allow you to copy the NOI information into the proposals cover page for you to update as necessary. If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user User ID and password can be used to complete the electronic proposal cover page in response to this research opportunity announcement.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to *http://proposals.hq.nasa.gov* and performing the following steps:

- Click the hyperlink for **new user** which will take you to the Personal Information Search Page.
- Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
- Confirm your personal information by **choosing** the record displayed.
- Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Proposal Cover Page.**

A hard copy version of this Cover Page must be printed in time to acquire signatures and include with the original hard copy of the proposal for delivery according to this NRA schedule.

Proposers are advised that they must not reformat this Cover Page after it is printed, as important NASA-required documentation may be lost. Proposers without access to the Web or who experience difficulty in using this site may contact the Help Desk at proposals@hq.nasa.gov (or call 202.479.9376) for assistance. Please note that submission of the electronic Cover does not satisfy the deadline for proposal submission.

Proposal Cover Page

NASA Research Announcement 00-OES-05
Proposal No. _____ (Leave Blank for NASA Use)

Research Area:	Geodynamics	_____
(please check one;	Topography and Surface Change	_____
however, joint science	Applications (End User)	_____
and applications is OK)	Grace Science Team	_____

Title: _____

Principal Investigator:_____PI Signature: _____

Department:_____

Institution: _____

Street/PO Box: _____

City: _____ State: _____ Zip: _____

Country: _____ Congressional District:_____
(used for database sorting purposes only)

E-mail: _____

Telephone: _____ Fax: _____

Co-Investigators:

Name	Institution & Email Address	Address & Telephone
_____	_____	_____
_____	_____	_____
_____	_____	_____

Budget:
1st Year: _____ 2nd Year: _____ 3rd Year: _____ Total: _____

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i*) Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs, and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Title of Authorizing Institutional Official: _____

Signature: _____ Date: _____

Name of Proposing Institution: _____

Telephone: _____ E-mail: _____ Facsimile: _____

Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or posession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear on the Proposal Cover Sheet above are authorized to sign on behalf of the Applicant.

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

BUDGET SUMMARY

For period from _____ to _____

- Provide a complete Budget Summary for year one and separate estimates for each subsequent year.
- Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
- Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs*	_____	_____	_____
4. Other Applicable Costs:	_____	_____	_____
5. SUBTOTAL--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Carryover Funds (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. Total Estimated Costs	_____	_____	_____
9. APPROVED BUDGET	_____	_____	_____

*** Facilities and Administrative Costs**

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:
    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Indirect Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

*** Facilities and Administrative**

UNAVCO SUPPORT REQUEST FORM

The University Navstar Consortium (UNAVCO) Boulder Facility has supported NASA investigators in the use of Global Positioning System (GPS) equipment and technology for Earth studies since the early 1990's. The Boulder Facility provides to NASA grantees GPS equipment for episodic and continuous GPS measurements, engineering support for in-field measurements, technical consulting support for data collection, communications and management, data archiving support, and training and technology transfer as required by individual projects using GPS. In order to determine more accurately the scope and costs of this support role for individual NASA projects, any investigator requiring GPS support from the UNAVCO Boulder Facility should include the following information as an addendum to their proposal. Use the following numbered sections and keep the total length less than 2 pages. Single spacing may be used if necessary.

1. Principal Investigator Name, Institution and Contact Information.

2. List of Collaborators and Their Responsibilities with Emphasis on In-country Collaborators for Non-U.S. Projects.

3. Brief Discussion of Intended Science Goals, Preferred Style of GPS Data Collection (e.g., Episodic, Continuous, Real Time Kinematic), and Required Measurement Precision. Include Requirements for Any Associated Data Measurements, e.g. Meteorological, Tilt Meter, Seismic, Gravity, etc.

4. Approximate Dates and Location of Data Collection Activity Including Desired Density of Episodic Measurements, Number and Location of Permanent Stations, Methods of Mixing Continuous and Episodic Measurements, etc.

5. Equipment Requirements Including Short-term , Long-term, and/or Permanent Loan of Receivers, Antennas, Communications Equipment, Data Download Computers, Solar Panels, Monuments, Equipment Housing, Tripods, Tribrachs, etc. (See http://www.unavco.ucar.edu for sample equipment lists and budgets).

6. Requirement for Field Engineer Support Including Nature, Location and Time Frame of Support, Special Language Requirements, Special In-country Experience Requirements, Need for On-site Training of Project Personnel, Concerns About In-country Security/Safety Considerations for Project Staff, etc.

7. Any Known Special Hardware or Software Development Requirements, e.g. Data Translators for Special Receiver Types, Data Download Scripts for Special Download Platforms and Operating Systems, Special Monumentation Requirements, Special Power Requirements, etc.

8. Special Training and Technology Transfer Requirements, Especially for Foreign In-country Collaborators Including Preference for Training at the Boulder Facility vs. In-country Training.

9. Potential Means for Data Communications from Continuous Stations Back to Home Institution, UNAVCO Boulder, and/or the Crustal Dynamics Data Information Service (CDDIS), e.g. Internet Connection, Phone Modems, Manual Download and Mail Delivery, etc.

10. Requirement for Long-term Maintenance and On-site Support of Permanent Stations. Specify In-country Collaborator Role/Responsibility Related to Station Support.

11. Data Archiving Plan, Including Providing Access to Near Real Time Continuous GPS Measurements. Investigator responses to these questions will be used by the Solid Earth and Natural Hazards Program Office for determining the appropriate level of UNAVCO support for individual projects as part of the award decision for individual grants. Complete information will assure a better and more complete evaluation of the necessity and cost-effectiveness of specific support requests.

APPENDIX F

Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**.

User identifications (IDs) and passwords are required by NASA security policies in order to access the SYS-EYFUS Web site. If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to *http://proposals.hq.nasa.gov* and performing the following steps:

- Click the hyperlink for **new user** which will take you to the Personal Information Search Page.
- Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
- Confirm your personal information by **choosing** the record displayed.
- Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Notice of Intent.**

At a minimum, the following information will be requested:

- NRA number, alpha-numeric identifier, (Note: this may be included on the Web site template);
- the Principal Investigator's name, mailing address, phone number, and E-mail address;
- the name(s) of any Co-Investigator(s) and institution(s) known by the NOI due date;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal. Note that this NOI may also be the preliminary version of the proposal *Cover Page/Proposal Summary*; if so, the Web site provides the user future use in updating this information for the final *Cover Page/Proposal Summary* as the deadline for submission of the final proposal approaches.